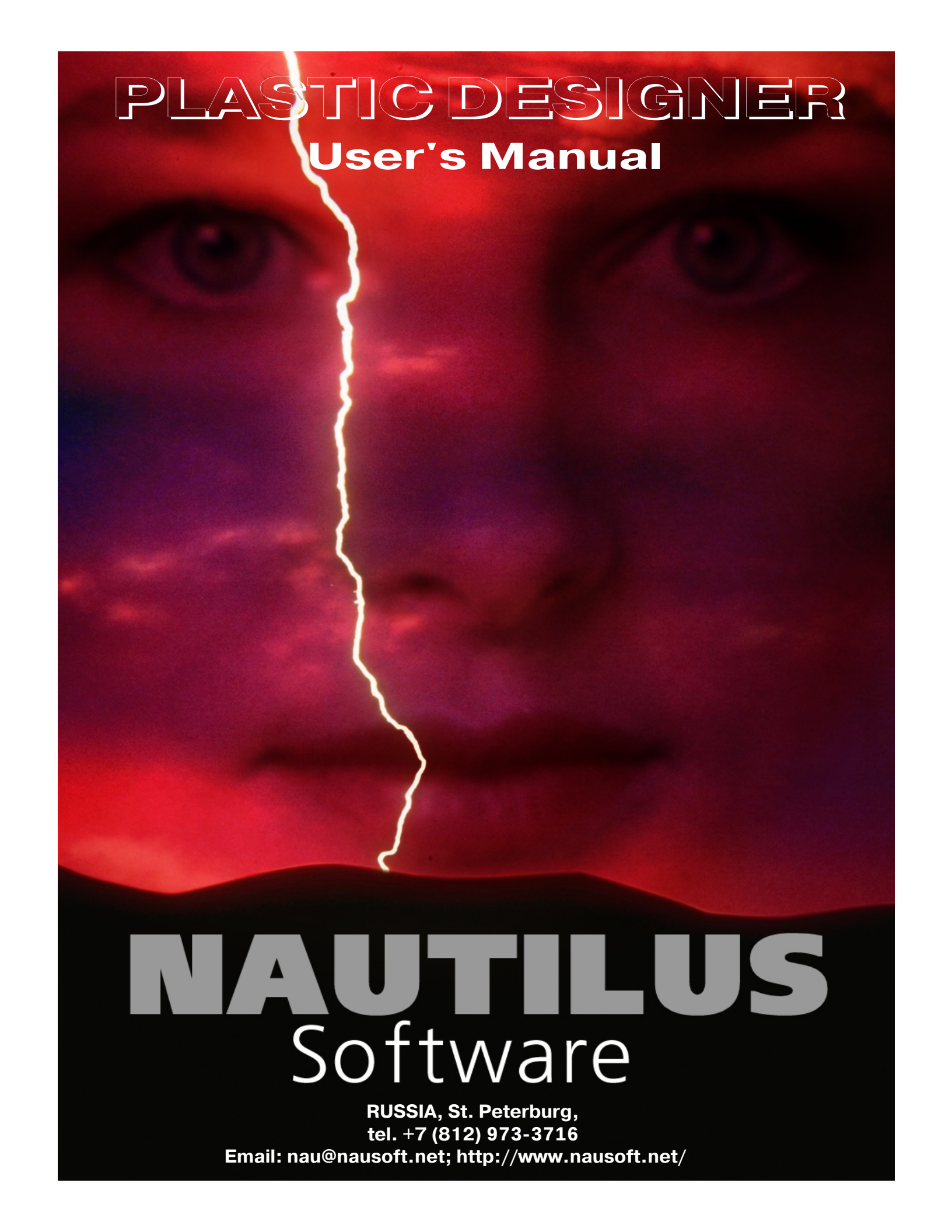




PLASTIC DESIGNER

User's Manual

NAUTILUS

Software

**RUSSIA, St. Peterburg,
tel. +7 (812) 973-3716**

Email: nau@nausoft.net; <http://www.nausoft.net/>

Introduction

During the last years the computer became a usual phenomenon at the numerous cosmetic centres, clinics and can provide the experts in any area of medicine with a wide range of opportunities. The computer technologies are already at such level of development that they can be useful to man in spheres where creative thinking is required and it is necessary to operate with categories other than mathematical. For example, modelling of plastic surgery results and hardware cosmetology procedures, diagnostics of hair and skin condition. The most complex but extraordinary interesting subject is the application of the computer in the field of plastic aesthetic and reconstructive surgery.

The main task that is carried out with the help of specialised software is to let the patient and the doctor see the probable results of the operation even before it is performed. The program allows to consider separate details and the received image as a whole, to compare various variants. If the doctor wishes he can simulate with the help of the program the patient's status during the postoperative period. He can prepare the patient beforehand that during the recovery period the patient's status and the impression from the patient's own appearance can be not so pleasant.

What the patient will see can ensure his wish to make changes or on the contrary, to refuse from the operation. The program gives the doctor a number of arguments for convincing the patient. However, if the patient comes to a conclusion that the operation is not worth making, it means that the doctor has not allowed the patient to be disappointed and relieved himself from unpleasant explanations after the operation.

The computer equipment in combination with the software allows to make photos of the patient in place and to print them out together with the doctor's comments on peculiarities of prospective intervention. Besides that it is possible to save the information on the patients (data, photos, x-ray), to store it and at any time to retrieve from the computer medical database. Besides the doctor has a wonderful opportunity to discuss the results of the future operation with the patient without the patient's presence. Even if the patient lives in another country it is sufficient to receive his photos over the Internet and in the same way to send back the variants of results of the prospective operation and the offers.

We thank you for using our software. If you will have any comments or remarks on the work of the program, we are ready to take them into account in the next versions of Nautilus Plastic program.

1. Program users

When we started writing the program we assumed that the users of the program will be the surgeons conducting reception of the patients and performing operations. The program is a universal tool and the more skilled hand uses it the more valuable results are received. Besides that the program contains a lot of appliances and tools that can be useful to the surgeon in his work during the preparation for an operation.

Basing on the already existing experience of use of our program in plastic surgery clinics we know that even a person who does not have direct relation to the operation can work with the program. The main task of this person (we'll call him the operator) is to make a selection of problem patients and to satisfy the interest of the patients coming to visit mostly out of idle curiosity. In this case the valuable time of a surgeon is saved. If the patient is ready to continue a detailed conversation after the primary consultation, the second advice with the use of the computer is carried out by the surgeon, who has all preliminary data on the given patient. Naturally, the operator should be well prepared for the consultations to be competent in modelling of appearance and to work in close co-operation with the performer of the operation.

In case of application of the program for changing of the results of influence of hardware cosmetology procedures it is the most reasonable if the expert who is carrying out these procedures works with the program. The person working with the program should know how many procedures it is necessary to perform to achieve a certain result. Situations are possible when a patient prepared to undergo hardware influence understands in the course of a talk with an expert in hardware cosmetology that his problem can be solved only by surgical intervention. Modelling of plastic surgery results can be offered in this case and the second consultation can take place already in the walls of a medical establishment.

2. Organisation of service of plastic surgery results modelling

Nautilus Plastic program can be applied as an independent commercial project. That is, it can be used as a separately paid service offered directly at the medical centre or, for example, in a high-class beauty parlour. Such beauty parlour can work together with the medical centre and provide primary consultations to the patients and also rehabilitation of those patients who have undergone operation and require hardware cosmetology procedures, massage and so on. The examples of such mutual co-operation of medical centres with beauty parlours exist in Russia.

The service «Plastic surgery results modelling» or «Consultation of a plastic surgeon» can be popular since the clients of beauty parlour can decide right there whether in general they can expect that their problem can be solved by an operation. For a potential patient to cross the threshold of a medical centre it is necessary step over a psychological barrier – he should already be 50 % sure that he wants to do it. But if he is not so sure then a voluntary visit to an «independent» plastic surgeon in a beauty parlour is really a solution. The only warning to the organisers of such a service is that it should not be transformed into entertainment and a show discrediting the methods of plastic surgery.

Modelling of plastic surgery results and influences of hardware cosmetology procedures can be an integral part of work with clients. Such an application of the program in itself brings success to the whole business, makes the patients sure that they are in hands of professionals.

3. Program as a tool of improvement of mutual understanding between the surgeon and the patient

The experience of work of our program at the medical centres shows that the program allows to solve several important problems.

The patient can see the result that is either pleasant to him or not. It will strengthen his desire to resort to an operation or will make him to reject this idea altogether. The choice makes the patient trust the expert and the given medical establishment. Even if the patient has not agreed for this operation (for example, rhinoplasty), he can think about another operation (for example, blepharoplasty) to improve his appearance. In any case, you will be surely recommended as a skilled expert who can be trusted.

The surgeon will save himself from unpleasant trials, when the patient is not satisfied with the result of the operation caused by mutual misunderstanding at the initial stage. Besides that, the preliminary modelling allows to eliminate the scandalous patients who by virtue of their character are always dissatisfied by something. The future problems with such patients become visible at once at the stage of computer modelling.

4. Concurrence of the results of the operation with the results of preliminary modelling. Responsibility of the doctor

Everybody knows that the result of any operation depends on a large number of circumstances. Therefore it is difficult to imagine a universal algorithm of the operation and postoperative period. To program such an algorithm we should enter thousands of variables into the formula even for the simplest operation. The surgeon planning operation aims at a certain result and the more skilled he is the closer to the ideal the result will be. Unfortunately, the patient who is far from medicine is not ready at first to that approach. Therefore surgeon even before the operation warns the patient about possible complications, concludes a contract with him.

For the same reason it is impossible to consider the result of modelling a document. Each surgeon understands that. Therefore at the request of the users of our program we have made a warning window saying, "This image is received with the help of computer modelling. The result of operation can differ from it". You can change the text of the warning or it can be removed completely or printed at the bottom of a result sheet on the printer (see 7.3).

5. Working with the program

5.1 Program installation and running.

1. Insert a CD with the program in the CD-ROM.

Double click «My computer» icon.

Choose Plastic icon by double clicking.

Double click Disk 1.

Run Setup.exe.

Respond to questions.

Program is being installed.

2. Insert the electronic key in LPT1 port.

3. Install the key driver:

Press Start, Run.

Specify the path to the program «C:/Program Files/Nautilus/Surger/Novex/instdrv.exe».

Click «OK».

5.2 External devices of images input.

The fundamentals of photographing.

The input of photos into the program can be carried out from any input device, and also from a file from any carrier.

The simplest way to input the images is through TWAIN, a special program allowing to work directly with the external device of image input. If your external device is not supported by TWAIN, then input the image from a file. The detailed step-by-step instructions you will find in the appropriate sections of the manual.

The format of the image used for input into the patient's card of the section «Card file» is JPG, for input into the section «Modelling» - BMP, into section «Preparation of presentation» - any graphic format.

Pay attention, that in the current version of the program has the following restriction; the photo should contain the colour 24-bit image, and the size of the photo should not exceed 1600x1600 pixels.

Photographing is crucial since it influences the reliability of results. The illumination should be natural and even (without shadows and patches of light) on the whole surface that will be subjected to modelling. Pay attention to accuracy of camera angles.

In the beginning of work calibration of the images is performed. While making a photo place a ten-centimetre pattern, for example a ruler, next to the patient's face. Later on this pattern is used for reduction of the images to the uniform size.

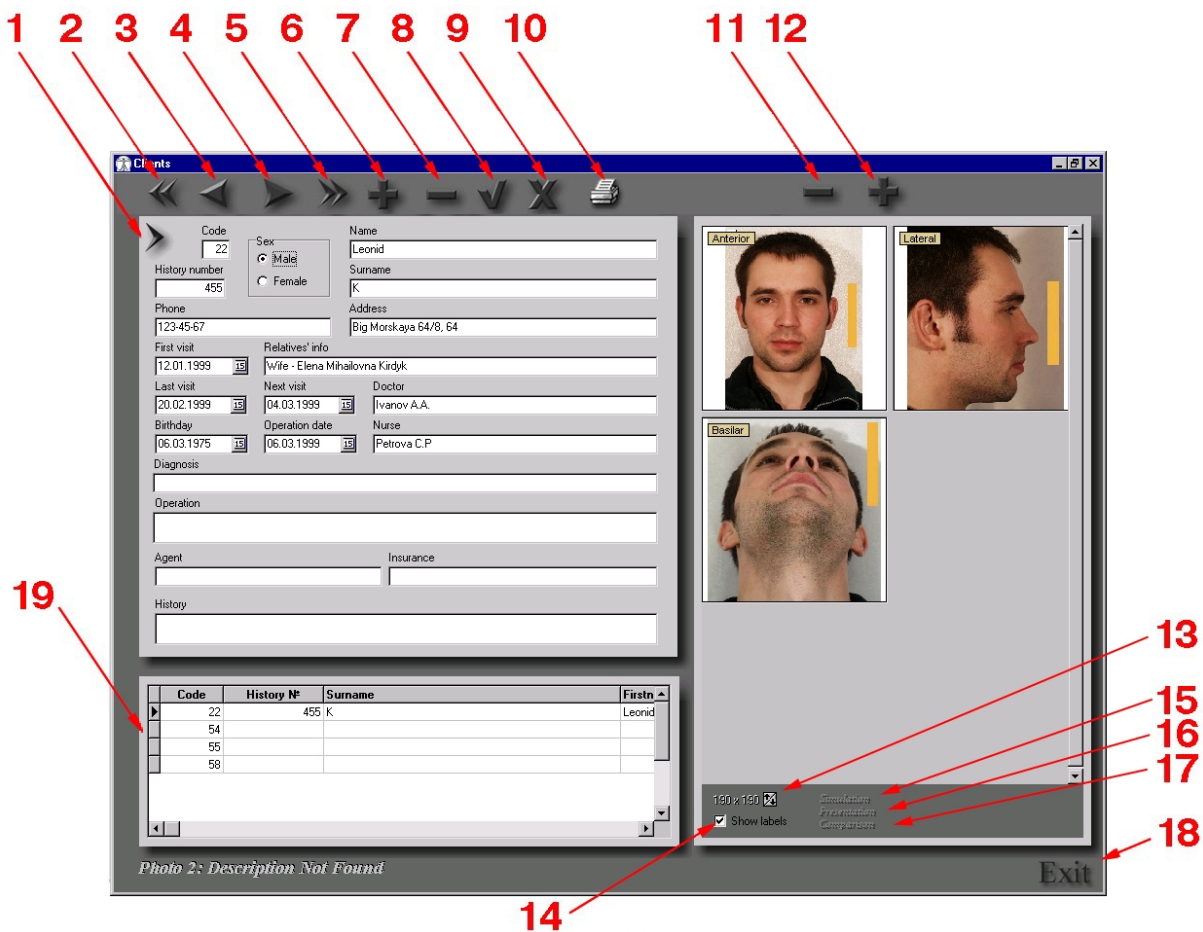
The rules of work with your input device (digital camera, scanner) can be found in its manual.

5.3 Printing out results.

You can print from the sections «Card file», «Modelling» and «Preparation of presentation». You can set printer options from the program (see 6.1.3, 8.6). The information on your printer properties can be found in its manual.

6. Card file of the patients

The card file allows to enter, change, save and delete the information on your patients, and also to carry out search by some attributes. In case of accumulation of much information, it is necessary to organise storage of this information on additional carriers (see 11.1)



The section «Card file» contains the following buttons and inscriptions (fig. 1):

-  **№1** Go to subsections of patients' cards
-  **№2** First card in the card file
-  **№3** Previous card in the card file
-  **№4** Next card in the card file



№5 Last card in the card file



№6 Add a card to the card file



№7 Delete the card from the card file



№8 Save changes to the card



№9 Cancel changes of the card



№10 Print

Clients

✓ X

ASSESSMENT

PATIENT NAME: Leonid K

TIP

Volume	I (+ 1, 2, 3) (- 1, 2, 3)
Definition	I (+ 1, 2, 3) (- 1, 2, 3)
Width	I (+ 1, 2, 3) (- 1, 2, 3)
Position	IN (I, +, -) EX (I, +, -)
Rotation	IN (I, +, -) EX (I, +, -)
Projection	IN (I, +, -) EX (I, +, -)

RARIX

Level	I (+ 1, 2, 3) (- 1, 2, 3)
Depth	I (+ 1, 2, 3) (- 1, 2, 3)
Angles	NFR 0 degrees NFA

DORSUM

Bony vault	
Height	I (+ 1, 2, 3) (- 1, 2, 3)
Base width	I (+ 1, 2, 3) (- 1, 2, 3)
Bony length	I L S
Cartilage vault	
Height	I (+ 1, 2, 3) (- 1, 2, 3)
Length	T W N

190x190 ☒ Show labels

Simulation
Presentation
Comparison

Exit

- №11** Delete the photo from the patient's card
- №12** Add a photo to the patient's card
- №13** Change the size of the photo on the screen
- №14** Show photos in the card (cancelled for scrolling through the card file)
- №15** Modelling section
- №16** Section of creation of presentation materials
- №17** Sections of comparison of modelling results
- №18** Exit from the program
- №19** Split (allows to extend / reduce the field of the card)

The patient's card consists of four subsections:

- The card with the data on the patient, photo;
- Examination sheet (information, graphs, figures);
- Operation planning sheet (data, graphs, figures);
- Measurements (results of measurements of distances, angles made and calculated before the beginning of modelling).

The change of subsections of a card is carried out by pressing button №1 (figure 1).

6.1 Subsection Client's card.

If your card file is still empty it is necessary to begin filling it. You can make a card for a new patient by pressing button №6. The patient's code is assigned automatically and later allows to identify the given patient.

The items requiring entering date can be filled directly or through a choice of date in the calendar. The calendar is activated by clicking the mouse arrow key on the right part of the information cell.

Before filling in the medical history press F3 button on the keyboard. It allows to enter the current date automatically. Then enter the information.

Moving through the text is carried out with the help of up and down arrow keys on the keyboard. If the cell «Medical History» is covered by the bottom bar, lower the bottom bar by dragging split №19 by the mouse (fig. 1).

After filling the card save it by pressing button №8.

You can delete the card from the card file by pressing button №7 (fig. 1).

Let's assume that you need to change or to add the information to an existing card. For this purpose use button №8. Button №9 cancels last changes.

Moving through the card file is carried out by buttons №2, 3, 4, 5.

6.1.1 Working with photos in the patient's card.

The input of photos of the patient is carried out by pressing button №12. In the photo field a free cell form a new photo appears. It is possible to replace a photo in a card file by a new image. Click on the cell where the new photo will be inserted by the right mouse button. The following menu will appear:

- Acquire from file;
- Acquire from TWAIN (image received from a digital camera, video camera, scanner);
- Save to file.

Further import the photo in the way that is convenient for you. The number of necessary photos stored in a card file is unlimited. But first three photos are basis images and should

correspond to projections: Anterior, Lateral, Basilar.

Item Save to file (see 11.1) allows to save the images on any carrier.

The comments to a photo are entered in the following order: double click by the right mouse button the necessary photo. You will see an active window with this photo, to the bottom part of which you can enter the necessary textual information (up to 130 signs).

Deleting photos from a card is carried out with the help of button №11 (fig. 1). The first 3 photos are basis images and are not subject to deletion in future.

The size of photos on the screen can be changed with the help of button №13 (fig. 1).

Cancelling the display of photos in a card is made with the help of button №14 (fig. 1). It can be necessary for quick viewing of the textual information in a card file as the process of image loading on the screen requires certain time.

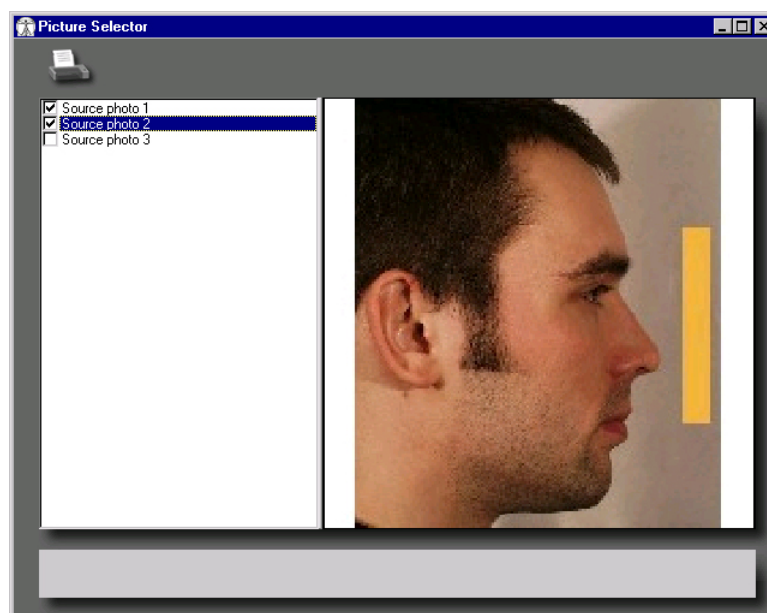
6.1.2 Search in the card file.

The search by the given categories is carried out with the help of the bottom bar that contains the table of codes, medical histories, as well as full names of the patients. If the list of the patients is large, spread the bottom bar upward by dragging split line №19 with the help of the mouse.

To make a search place the cursor on the necessary category (patient code, №of medical history or first name, patronymics, last name) and press F3 button on the keyboard. In the top part of the list a free line will appear for entering the information for search. Press the Enter button on the keyboard. The required card of the given patient will appear on the screen.

6.1.3 Printing from the card file

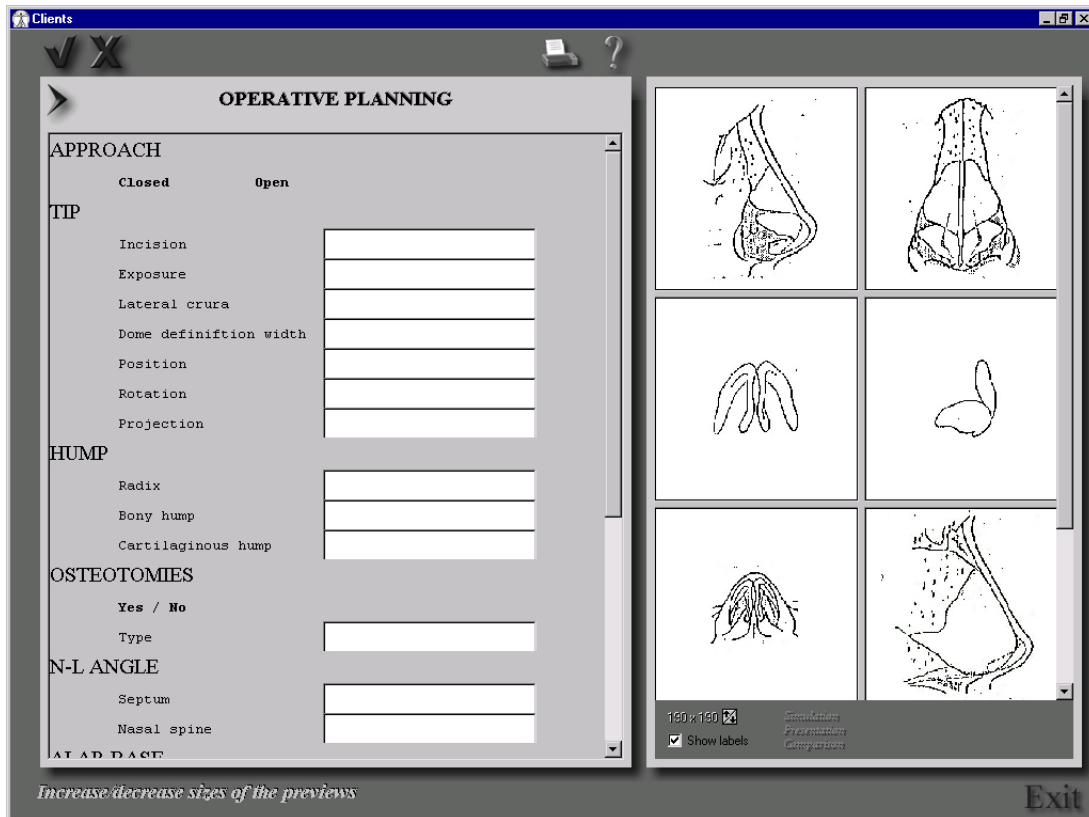
To print photos and main data on the patient press button №10. Then you can mark the photos that should be printed out in the opened window. Press the button «Print». You will enter the mode of automatic creation of the sheet type. In the same mode you can set the printer parameters. Then you can start printing (fig. 4).



6.2 Subsection “Examination Sheet”.

This subsection can be used in case of rhinoplasty. The ready Sheet of pre-operational examination is offered. You only have to select the necessary items of the text with the cursor.

You can enter comments to figures, schemes. For this purpose double click the image in the card. An additional toolbar with the image and a window at the bottom of it will open



where you can enter the text of the comment.

If you want to edit graphs and figures from the examination sheet, double click the left mouse button on the image. An additional toolbar will appear, double click it and you will enter the editing mode. Now, using editing tools make necessary changes, colour areas, etc. (see 7.6). Then leave the editing mode with the help of button №49 «Exit». You will return to the mode «Card File / Examination sheet». Close the additional toolbar and the corrected image will be automatically placed in the initial place in the card.

Printing of the examination sheet is performed by button №10. You can see the print preview and also change the printer properties. If everything satisfies you, start printing the sheet.

6.3 Subsection «Sheet of operational planning».

This subsection can be used for pre-operational planning of rhinoplasty. A ready Sheet of operational planning is offered. You only have to select the necessary items with the cursor. Other functions are carried out in the same way as the subsection «Examination Sheet» (see 6.2).

7. Preparation for modelling.

The preparation for modelling consists of the following stages:

- Input of photos, choice of a projection for work;
- Calibration, definition of basic distances and angles for the subsequent calculations;
- Application of modelling mechanisms to the given area.

7.1 Program interface

The buttons of this section are shown in fig. 5.



№20 Step forward / back

Anterior

№21 It has three values: Anterior, Lateral, Basilar. It loads the appropriate basic photos from the patient's card. The switching of values is performed by pressing the right and left mouse buttons.



№22 Responsible for input of photos. Has two values: the right mouse button - the choice of the device of image input, the left mouse button - the input.



№23 Rotates the photo 90, 180, 270 degrees on the screen.



№24 Help information about the program.



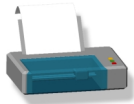
№25 Zooms the photo in and out with the help of the left and the right mouse button respectively.



№26 Activates the mode of measurement of distances and angles, activates the toolbar of measurements.

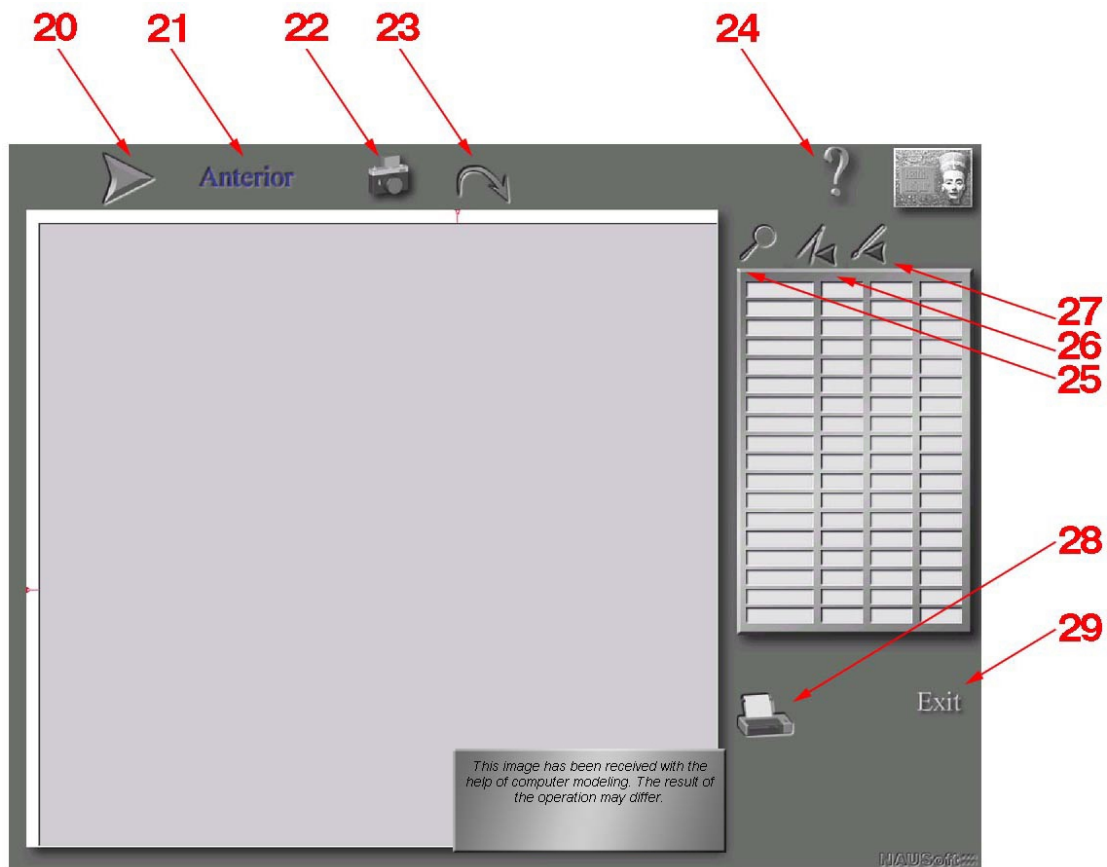


№27 Activates the mode of image editing, activates the editing toolbar.



№28 Prints the current photo with the help the left mouse button, choice of the printing device – right mouse button.

Exit **№29** Exit to the mode «Card file».



7.2 Ways of photos loading.

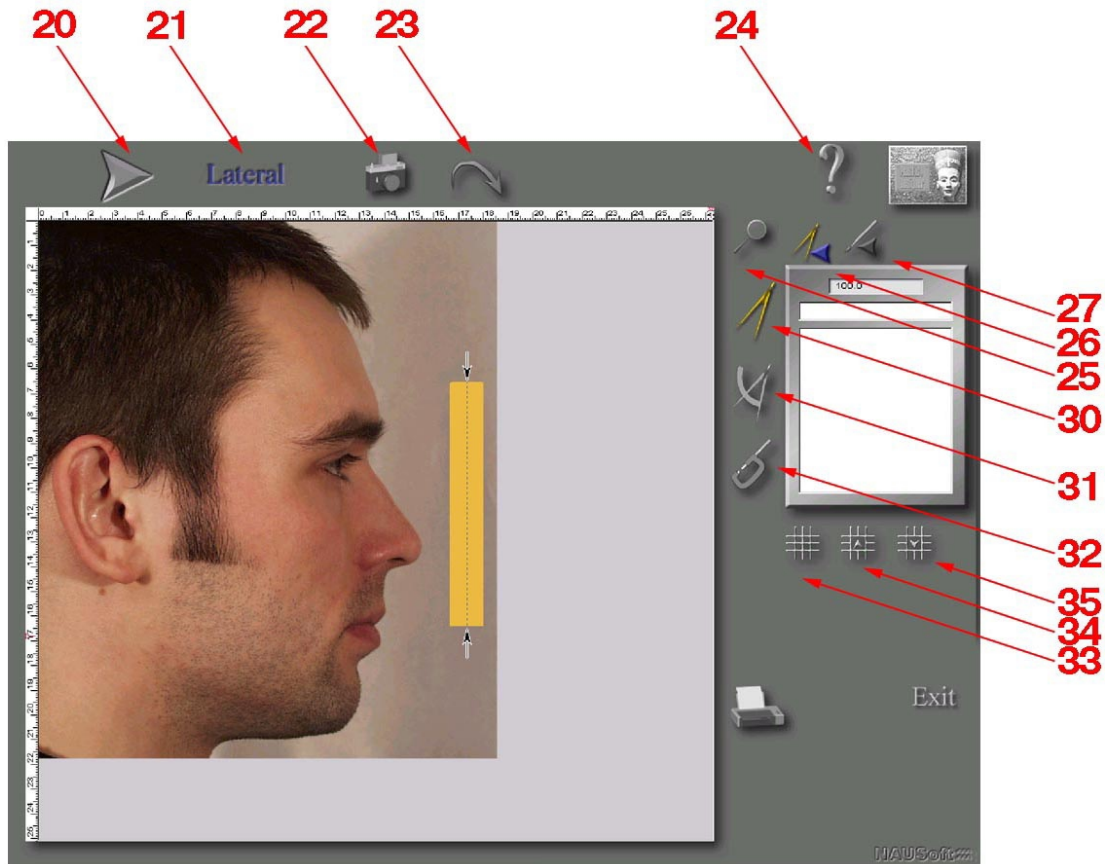
At transition to the Modelling mode the basic photos are automatically loaded from the card file according to projections Anterior, Lateral, Basilar.

In case any of the projections should be loaded not from the card file but from a file, it is necessary to choose the necessary projection by button №21. Then simultaneously by

buttons «Ctrl+L» on the keyboard activate the window of choice of a file. The photo chosen from a file will appear in the current window. Besides there will be a change of a basic photo in the patient's card.

A photo for modelling can also be received through TWAIN from a camera or another source. For this purpose use button №22.

Image format for input into the patient's card of the section «Card file» - JPG, for input into the section «Modelling» - BMP.



7.3 Warning

In the modelling mode you can always see on the screen a window warning that the result of computer modelling can differ from the result of the operation. Besides the warning is printed out together with the results of modelling.

The warning can be moved on the screen. For this purpose move the cursor to the window and press the left mouse button. Without releasing it move the window.

The text of the window of warning can be changed at your discretion. For this purpose click on the working area with the left mouse button. Then press simultaneously keys «Ctrl+T». The option window will appear on the screen. In the editing line you can change the text of the warning. You can cancel the window of warning on the screen by unselecting the appropriate option.

To cancel/start printing the warning line at the bottom of patient photos select/unselect the appropriate line.

To cancel/start printing the time and date at the bottom of patient photos select/unselect the appropriate line.

After you have changed the options press the button «OK» to confirm the changes or «Cancel» to cancel the changes.

7.4 Calibration of the images.

This stage of work is necessary for reduction of the relative sizes of the photo to real ones. The patient should be photographed with 10-centimetre ruler (see 5.3).

Activate by button №26 the measurement toolbar (fig. 6). Choose the tool «Compasses» by button №30. Put it on the pattern and press button №32 «Calibrate». On the edges of the photo horizontal and vertical rulers will appear.

! Do not forget to calibrate the images of all basic photos.

7.5 Measurement toolbar

Distances and angles.

For measurement of distances tool №30 «Compasses» is used. Seize by the cursor the compasses pointer and place it on one of the points of the measured object. Repeat the actions for the other point.

It is possible to move the tool completely. For this purpose in addition press the button «Ctrl».

For measurement of angles use tool №32. Seize by the cursor the beam of the angle and move it. Similarly repeat actions for the other beam.

Move the angle by the cursor pressing simultaneously the button «Ctrl».

In the right top line of the table the current value of distance or corner will be displayed.

If you want to save this value, place the cursor in the second line of the table and enter the prospective designation or name. Then press Enter. The name of parameter and its value will be entered automatically into the information part of the table. Thus, you can make a list of measurements of distances and angles that can be useful for you in subsequent calculations. These data will automatically be entered into the patient's card in the subsection «Measurement» and can be printed out from there.

7.5.1 Zooming and moving a photo.

To zoom in/out the image apply tool №25 «Magnifying glass». When you zoom out a photo the scale of the rulers is increased accordingly.

To moved the zoomed photo seize the image by the right mouse button and pull in the necessary direction.

7.5.2 Application of auxiliary grid.

Auxiliary grid is necessary for more precise measurements of distances and angles. Make the grid with the help of button №33. Scale of the grid can be changed with buttons №34, 35. The crossing of red lines of the grid is the central point, from which expansion/narrowing of the gridlines is made.

To combine the gridlines with details of the face apply the function of photo zooming out and moving (7.5.1).

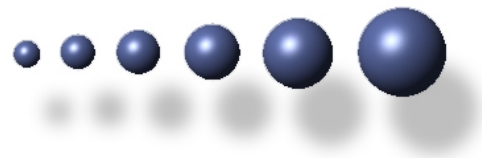
7.6 Tools of photo editing

Editing of a photo allows not only to improve the quality of the entered photo, but also enables to simulate the influence of some hardware cosmetology procedures and surgical intervention.

As to opportunities of editing with the help of the offered tools, the largest part of success of their application depends on your training.

The editing tools and their properties are shown in fig. 7.

TOOL PROPERTIES:



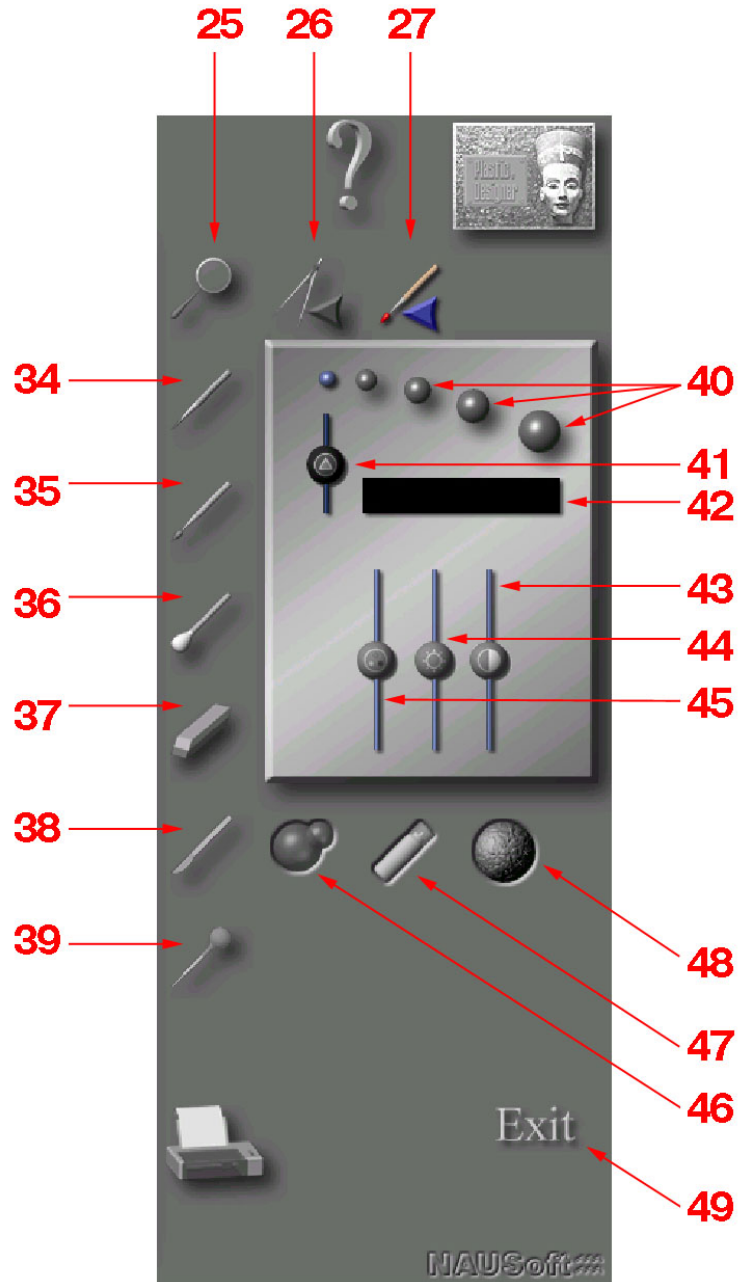
№40 «Degree of influence». To choose the degree of influence select one of five options by the cursor.

№41 «Intensity of influence scale».



The uppermost location of the slider means the minimal influence, the lowest - maximal.

№42 «Indicator of the current colour». To choose a colour click the right mouse button on the indicator and on the screen, a palette of 16 million colours will appear. The colour can be chosen from a ready palette of 48 colours on the left. For this purpose specify the necessary colour. It will be displayed in the window «Colour Solid». Then press OK. To choose a colour from a complete spectrum of colours place the cursor in the necessary place of a spectrum, in addition by arrow specify a tint on the extreme right scale. This colour will appear in the window «Colour Solid». Then press «OK». The chosen colour will be shown in window of the current colour №42.



TOOLS:

№34 «Pencil». Drawing lines with weight set by tool №40 with the colour set by tool №42 and degree of pressing determined by tool №41.



Choose the tool. In the working area move the cursor without releasing the left mouse button. You will get a line or a closed area. To draw a straight line press and keep the button «Shift» on the keyboard. Click on the working area with the left mouse button. Then pressing the button «Shift» move the cursor and make a new point by the left mouse button. The points will be automatically joined by a line.

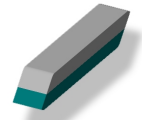
№35 «Brush». Drawing of wide lines of the given thickness, degree of pressing and given colour set with the help of tools №40, 41, 42.



№36 «Finger». Extends a point of the image where the cursor is placed. With the help of tools №40, 41 the intensity and width of influence is set.



№37 «Eraser». Erases a part of the image. The thickness is set by tool №40. For amplification of the influence «rub» the same place.



№38 «Scalpel». Cuts (allocates) area for:



- Copying and moving to any place;
- Colouring;
- Blurring, giving uniformity.

To select an area press and keep the left mouse button. Move the cursor by the contour of the selected area. Release the button of the mouse and necessary area will be rounded by a closed red line. The degree transparency (blurring) of edges of the allocated area is set by tool №40. To move the area to another place of the image press and keep the «Ctrl» key of the keyboard. Place the cursor on moved area. Press the left mouse button and keeping it down move the cursor. Release the mouse button and key «Ctrl». When the Scalpel tool is chosen the functions of work with area are activated.

№46 «Copy area» The copying and moving of the chosen area is carried out in the following order: move the cursor on the area chosen by the Scalpel. Press button №46 «Copy». Then transfer by the cursor the copied area to another place. Press again button №46 «Copy». The copied area will be fixed on the new place.



№47 «Paint». The colouring of the chosen area is carried out by pressing button №47. The colour is set on indicator of the current colour №42. The degree of intensity (transparency) of colour is set by the slider of tool №41. The degree of blurring of edges is set by tool №40.



№48 «Blur». Blurring, giving of uniformity of colour of the chosen area is carried out by pressing button №48. After pressing the button wait a little because if a large area is chosen for blurring the performance of function will require some time. The degree of blurring is set by the slider of tool №41. With the help of tool №40 it is possible to make edges of the area blurred or precise.



№39 «Dropper». You can take any colour from the image by the «Dropper», make it the current colour and use it by painting tools. For this purpose press the tool «Dropper». On the working area click the left mouse button. The colour is defined as average value of colours of the given square. The size of the square is set by tool №40. The current colour will be displayed in the window of indicator №42.



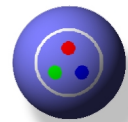
COLOUR CORRECTION OF A PHOTO:



№43 «Contrast».



№44 «Brightness».



№45 «Colour».

Exit **№49 «Exit».** Transition to the section «Card file».

If you do not like the result of editing press the buttons on the keyboard «Ctrl+Z» to undo the last actions one by one.

8. Modelling

This chapter describes the procedure of modelling. Transition to modelling is carried out with the help of button №20.

You have already prepared the image in the necessary projection to work. If you have forgotten to make calibration, the program will remind to you of that. In such case you should open a measurement toolbar (see 7.4) and perform calibration. For convenience of work it is possible to set the grid. For this purpose also return to the measurements mode (see 7.5.2).

8.1 Modelling algorithm.

The sequence of actions of the modelling stage is shown in fig. 8.

Tracker is the system of points connected by lines with the of which the zone of change is designated. Tracker represents a closed area or a broken line. The initial tracker is exposed on the initial image on the border of the zone of changes. The resulting tracker is constructed by transferring the points of the initial tracker. The process of modelling consists in moving the changed zone from the initial position to the resulting place.

Choosing of boundary areas participating in modelling is carried out with the help of a closed broken line.

The program offers two types trackers:

- Free «Point Track», that can be applied to any kind of operations;
- Standard «Line Track», prepared specially for modelling in rhinoplasty.

To change trackers press the inscription by the left or right mouse button.

Standard tracker will be described below in chapter 12.1.

8.2 Installation of the initial free tracker.

The inscription «Point Track» in the top part of the screen means that you work with a free tracker.

Place the cursor on the working area, by pressing the left mouse button make a point. Release the left mouse button and move the cursor further trying to track precisely the border of change. Then set the second point in the same way, and so on.

If you are not satisfied with the constructed tracker and you want to begin anew click the mouse outside of the tracker and the tracker will disappear.

Double click the mouse when you are through and the tracker will be considered constructed (it will be shown by a bright red colour).

The transition to the following step is carried out with the help of button №20.

8.3 Construction of the resulting free tracker.

The inscription at the top of the screen «Set Track» means that you are in the mode of construction of the resulting tracker.

At first the initial and the resulting trackers coincide. Select any point of the tracker by the cursor and move it to the necessary place. In the same way go on moving other points.

Pay attention to the table of results on the right. The columns of the table contain:

1. Number of the point in the tracker in the order of construction.
2. The shortest distance between the initial and the resulting location of a given point.
3. Value of change of distance between the initial and the resulting point on axis O.
4. Value of change of distance between the initial and the resulting point on axis O.

The line containing the information on the current point is shown with red colour.

If you are not satisfied with the constructed resulting tracker and you want to begin anew click the mouse outside of the tracker and the previous work will disappear.

Upon termination of construction double click the mouse and the tracker will be considered constructed (it will be shown by bright green colour). Transition to the following step with the help of button №20.

8.4 Selection of the zone of modelling.

The inscription at the top of the screen «Set Area» means that you are in the mode of installation of the area of tissues around the zone of change, which will be also involved in modelling.

Setting points by the left mouse button designate the area of changes.

If the constructed area does not satisfy you and you want to begin anew, click the mouse outside the area and the previous work will disappear.

Upon termination of construction double click the mouse and the area will be considered constructed (it will be shown by bright blue colour). Transition to the following step with the help of button №20.

8.5 Getting the result.

If the area of changes is large you should wait several seconds before the result is received. The inscription at the top of the screen «Result» means that you see the result of modelling. For comparison of the result of modelling with the initial variant click the left mouse button on the inscription «Result». It will allow to go to the mode of the initial image «Source».

You can consider the result final and exit with the help of button Exit to the mode «Card file». You can continue modelling further, having accepted for the initial the very first variant or the received result.

If you wish to return to the initial image and to begin modelling anew return with the help of button №20 to the mode «Source». You can analyse the previous stages of modelling, for example set a new area of changes or construct other initial and resulting trackers.

If you think that you should make changes to the received result, it can become the starting image for the further modelling. From the mode «Result» return the necessary number of steps back with the help of button №20.

8.6 Saving the result in the patient's card.

If you consider that the result received by you is final leave the section «Modelling» in the mode «Result» with the help of button №18 «Exit». The result of modelling is automatically saved in the patient's card. You can enter the description of the received result that will be also printed out together with the photo (see 6.1).

Printing the result directly from the mode «Modelling» and the installation of the printer parameters is carried out by pressing button №28 «Print» by the left or right mouse button respectively.

9. Comparison of results of modelling

The comparison can be executed in two ways:

1. In the section «Modelling» after the result is received (at the top of the screen the inscription «Result» will appear). Point by the cursor to the inscription «Result» and by pressing the left mouse button change the status to «Source». Thus you will see the initial image. To return to the result press the right mouse button.

2. In the section «Card file» choose item №17 «Comparison» (fig. 1). On the screen the additional panel will appear, on which 2 photos are placed. You can place on the panel of comparison the images necessary for you from the patient's card. For this purpose click the left mouse button having pointed to the right area of the panel of comparison and also on a photo from the card file. The necessary photo will be placed on the panel of comparison. Now in the same way enter the second photo to the left area of the panel of comparison.

To zoom out the image on the screen press the icon Maximise in the top right corner of the panel of comparison. To return the images in the initial view press the same icon.

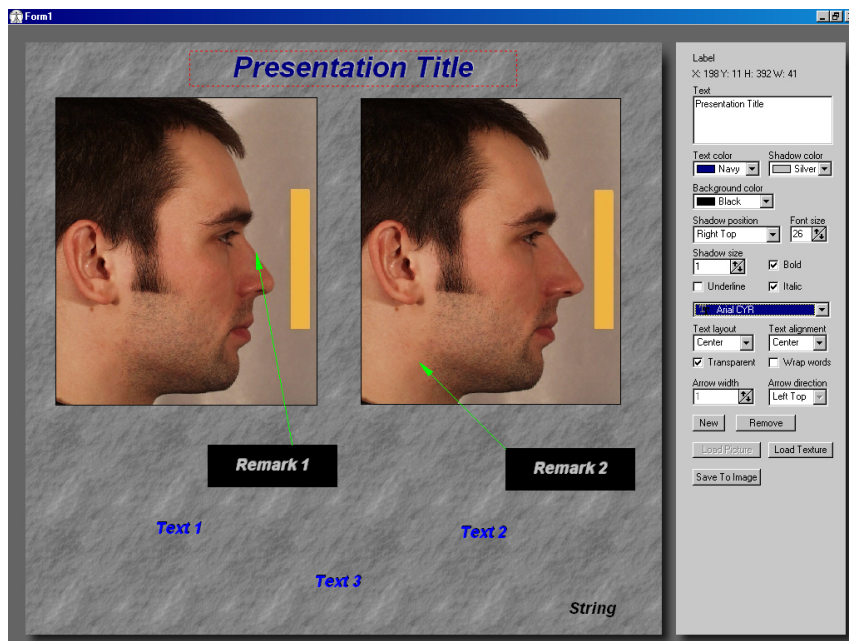
You can change the arrangement and size of a photo within the panel of comparison. Seize by the cursor a dividing line between photos and move it to the necessary side.

10. Preparation of presentation materials

The given section allows to create the illustrations with indices and comments. These materials can be used for discussion of forthcoming operations with the colleagues, for the dialogue with the patients, in case of preparation of the documents, publications, demonstrations, etc.

The created sheet of presentation can contain text, figures, graphs, photos accompanied by inscriptions, comments and indices in the form of arrows.

The section «Preparation of presentation» opens by pressing index №16 «Presentations» (fig. 1). In the right part of the screen the menu of functions is located, in the left part – the working sheet of presentation (fig. 9)



The sheet of presentations is formed as a DIY of such objects as a textual window, window of images, arrows - indexes. All these objects can be moved, their form, colour and size can be changed, they can be deleted, you can create new objects and fill them in with text. While working with text there is a possibility to change fonts, colour, to change the location and other options, which are described in the menu of functions. All these functions can be applied to an active object.

To activate an object it is enough to point the cursor at it and to click the left mouse button. The active object is shaded with a red frame.

To place photos and other images in a window of the images activate it. Then press the button «Image» and from the opened menu choose the necessary file.

For creation of new object press the button «New», choose from the menu the name of the object necessary to you. It will appear in the top left corner of the sheet. Seize it by the cursor and move to the necessary place. Dragging any of the corners extend it to the size necessary to you.

Upon termination of formation of a sheet of presentations save the result to a file with the help of the button «To keep».

The printing of a file with the presentation material is carried out by standard methods of the computer.

Close the mode «Preparations of presentation» by pressing the cross in the top right corner.

11. Additional opportunities

11.1 Saving results.

Results of work and the information on the clients can be saved on various carriers, for example, floppy disk, CD. The choice of the carrier depends on the size of the information and purpose. Let's assume that the result of modelling (photo) should be transferred to a floppy disk. At first it is necessary to save the photo to a file. For this purpose you can directly from the section «Card file» get the menu by clicking the right mouse button on the image. Choose item of the menu «Save to file». Write the filename. After that by standard ways transfer the file to the carrier.

Probably, you will want to save from time to time the card file of the patients (database) in archive as a backup. In this case it is recommended to save the folder with the database on another carrier or in another catalogue on the hard disk, we shall name it archive. The path to the folder with the database can be found as follows: through «my computer» choose the drive on which Windows is installed. Most likely, at you it will be a drive C. Then start the program Bdeadmin.exe, located at «C:/Program Files/Borland/Common Files/Bde/Bdeadmin.exe». The window will appear, choose at the left inscription «Surger», by clicking on the inscription. The full path will appear on the right, for example, Path «C:/ Program Files/Nautilus/Plastic Designer/Base». Remember this way for the further fast copying of the database.

Knowing the path to the database through “my computer” find the folder Database, and copy by it to the archive. In case of failure in the computer and the losses of the information, remove current Database from the program and copy the archived Database in its place.

The frequency of backup depends on how frequently it replenishes. You can it do it for example, once a week.

11.2 Input of x-ray snapshots.

The x-ray snapshots can be placed in the patient's card from an intermediate file the same way as any other images.

Scan an x-ray snapshot. Place the received image in an intermediate file with JPG format. Further place the image from the file to the patient's card (see 6.1.1). If necessary the snapshot can be placed in the section «Modelling» from the card.

For input of a snapshot directly to the «Modelling» section work according to 7.2.

11.3 Transfer of the information via the Internet.

Let's assume that your potential patient lives in the another city or even another country but he would like to receive consultation from you In this case offer to the patient to send his photos via email to your computer or, if you do not have email, on the address your friends. Describe to the patient what three projections of photos you need. Explain that in each photo should be a 10-centimetre standard for the further scaling. The photos should be received in JPG or BMP format.

Further through an intermediate file enter the images to the card of the potential client (see 6.1.1) or directly to the section «Modelling» (see 7.2). Carry out modelling in the usual way. The results of modelling (photo) can be saved in an intermediate file also in JPG or BMP format and sent as an email attachment.

Probably, you will need to accompany with results by the graphs, inscriptions and comments. In this case create the illustrations in section of «Presentation» (see 10). After saving to an intermediate file in JPG or BMP format you can also send the information by email.

12. Types of operations and ways of modelling of their results

In virtual space of the computer the different types of operations can be executed with the help of tools and functions of the program.

12.1 Rhinoplasty.

It is known, that the operations on change of the form of a nose are most frequent plastic operations. At the same time, these are rather complex operations not only in reality but also at modelling them in virtual space. The reason in that change of one parameter leads to automatic change of others as there is an interrelation of these parameters. There is also concept of an «ideal» nose, when the ratio of distances and angles corresponds to the certain established values. The ideal nose from the point of view of arrangement of the cartilages does not mean an ideal nose from the point of view of aesthetics for a particular patient. Therefore, it is very important to combine the possibilities of the surgeon and the wish of the patient. The computer modelling can help them.

At the stage of consultations with the patient and preparation for the operation use the standard examination sheet (see 6.2) and the sheet of operational planning (see 6.3).

At the stage of modelling the surgeon is offered built-in standard trackers for three projections: Anterior, Lateral, Basilar. With the help of this trackers it is possible to established the presence of asymmetries of the face, to change the distances, angles, to move points and to observe changes of proportions. In the table on the right the real, ideal values are shown and the difference between these values.

12.1.1 Work with the tracker in the Anterior projection (fig. 10)

Key points:

G	glabella
N	nasion
IN	intercanthal
T	tip
Al	alar basis
Pn	middle of subnasal fold
S	stomion
Ma	menton
O	the basis of the nasal bone
En	internal edge of the eye
Sn	subnosale

Basic lines:

Vertical line (VFP) through the points G and PC.

Vertical median line through IN on middle the nose back in the point O.

Vertical parallel lines through points en down to the level lip corners.

Horizontal line through the point **G**.

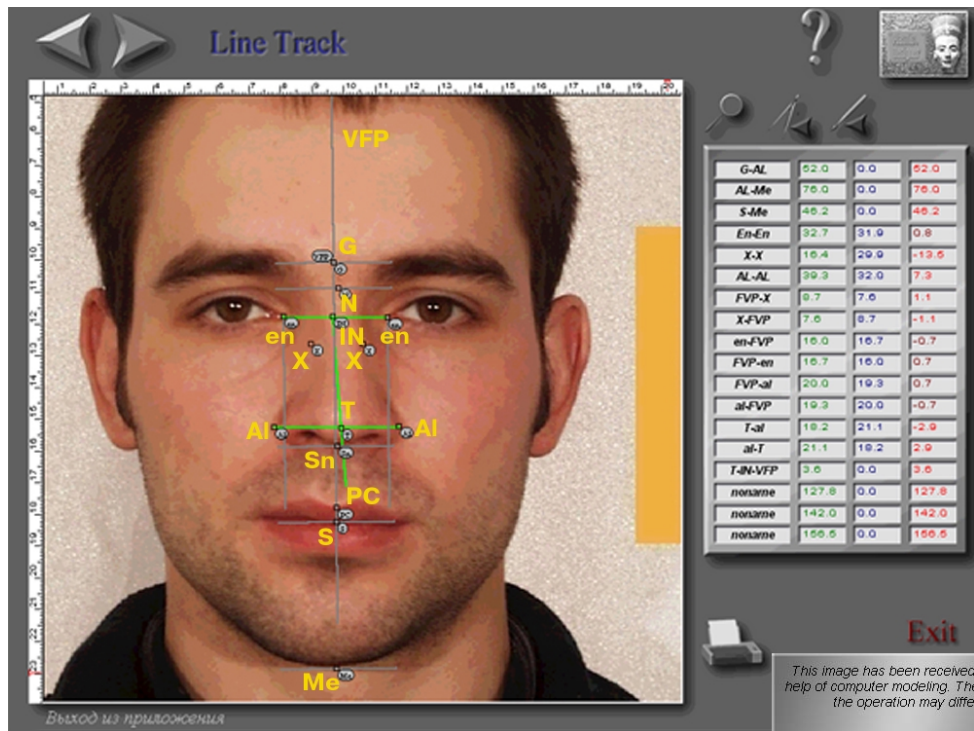
Horizontal line through the point **N**.

Horizontal line through points **Al-Al**.

Horizontal line through the point **S**.

Horizontal line through the point **Ma**.

Horizontal line through the point **Sn**.



Using a standard track set the points on the image of the patient. You receive an arrangement of basic lines, which allow to perform the visual analysis.

Information table contains the following data:

G-AI	projection of the segment G-AI on axis Y.
AI-Me	projection of the segment AI-Me on axis Y.
S-Me	length of the segment S-Me.
En-En	length of the segment en-en.
X-X	length of the segment O-O.
AI-AI	length of the segment AI-AI.
VFP-X	distance from the line VFP to the right point O.
X-VFP	distance from the left point O to the line VFP.
En-VFP	distance from the left point en to the line VFP.
VFP-en	distance from the line VFP to the right point en.
VFP-AI	distance from the line VFP to the right point AI.
AI-VFP	distance from the left point AI to the line VFP.
T-AI	distance from the point O to the right point AI.
AI-T	distance from the left point AI to the point O.
T-IN-VFP	deviation of the median line IN-T from the line VFP.

The first column - name of parameter, second column - real value of parameter, third column - ideal value of parameter, fourth column - deviation of the real value from the ideal value. And, if the deviation is more than 5-10 %, it is shown with bright red colour.

The visual analysis:

1. Measure the height of the median part of the face from G to AI-AI.
2. Measure the height of the bottom part of the face from AI-AI to Ia.
3. Measure distance from S to Ia.
4. Estimate proportions of the nose. The standard (en-en 31.9 mm)(X-X 24 mm) (AI-AI 32 mm).
5. Estimate deviations of the median line of the nose, width/narrowness of the nose departments in respect to VFP and the median line, define the asymmetry of these departments.
6. Estimate the tip of the nose (measurement T-AI): symmetry, wide/narrow, curvature (O-O).
7. The lines of edges of the back of the nose allow to define the asymmetry, wide parts.

If you require the lengths of segments and their projections on axis O and Y which are not included in the table, but can be received in the given projection, it is necessary to measure them manually. For this purpose on the top and left part of the image the rulers are placed. If not it is possible to receive values of the large accuracy, increase the image with tool №25 «Magnifying glass».

Each surgeon uses this or that technique of planning of operation and applies his own experience. As there is no ready algorithm of actions of the surgeon, the program offers the universal data, which can be applied by you at your discretion.

The algorithm of actions of process of modelling is similar to the algorithm of work with a free tracker. In the beginning you have established the initial tracker (shown by bright green colour) on the border of the zone of changes (nose). After the initial tracker is constructed, press button №20 for transition to the next step.

The resulting tracker (shown with bright red colour) is constructed by transfer of points of the initial tracker to a new place. Function of the resulting tracker is to specify the zones of changes of the nose.

As a result of construction of the resulting tracker there will be a recalculation of values in the information table.

The following step is the selection of boundary areas participating in modelling. For transition press button №20. By the cursor set the points for selection of the area adjacent to the nose that participates in the operation. In the table on the right there are data on deviation of points of the initial tracker from the resulting. In the first column - the names of parameters, in the second - actual values of deviation, in the third - values of deviation on axis O and in the fourth - values of deviation on axis O.

Press button №20 for recalculation and construction of the result of modelling. The further work with the received image is described in paragraph 8.5

12.1.2 Work with a tracker in the Lateral projection (fig. 11).

Key points:

G glabella
N nasion
S[^] supratip breakpoint
T tip
C[^] columella breakpoint
Sn subnosale
Ls upper lip border
S stomion
Me menton
Ac alar crease
N root of the upper eyelashes
R free point of rounding of the nose tip. (set between points O and C[^]).

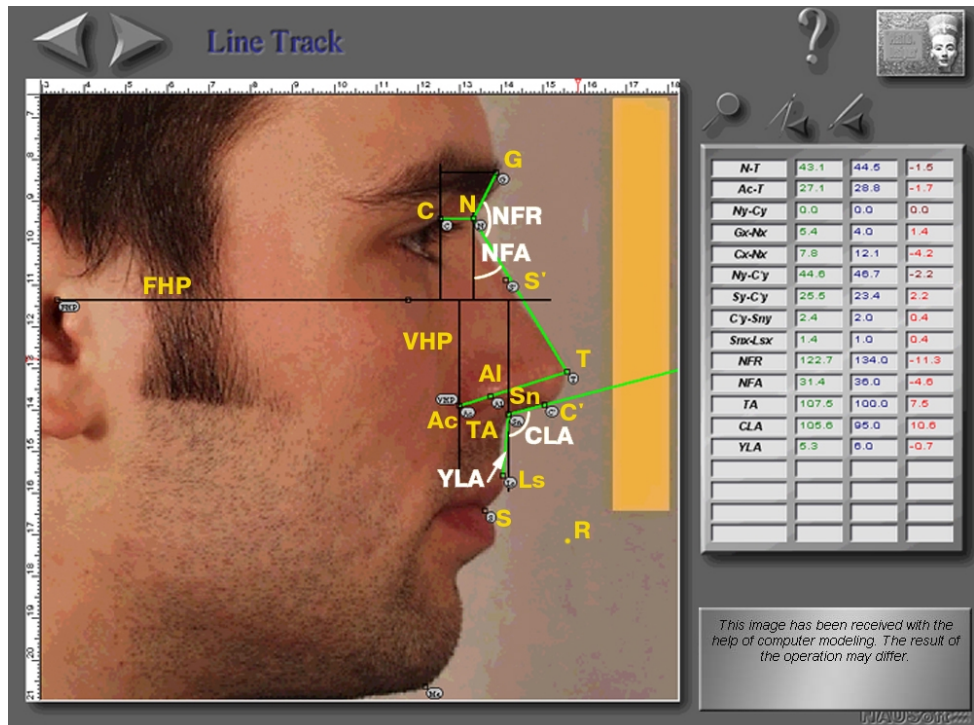
Basic lines:

Horizontal line (FHP) connecting the top edge of tragus and edge of the sub-eye crest.

Vertical line (VHP) going perpendicularly to FHP through the point AC.

Angles:

NFR nasofrontal
NFA nasofacial
TA tip
CLA columella-ladial
YLA



Using a standard tracker set the points on the image of the patient. You will receive the location of the basic lines and values of angles that allow to perform the visual analysis.

The information table contains values of parameters:

N-T actual distance between points.
Ac-T actual distance between points.
Ny-Cy projection of the segment to axis O.

Gx-Nx	projection of the segment to axis O.
Cx-Nx	projection of the segment to axis O.
Ny-C^y	projection of the segment to axis O.
Sy-C^y	projection of the segment to axis O.
C^y-SNy	projection of the segment to axis O.

The first column - name of parameter, the second column - real value of parameter, the third column - ideal value of parameter, the fourth column - deviation of the real value from the ideal value. And, if the deviation is more than 5-10 %, it is shown with bright red colour. If you require the lengths of segments and their projections on axis O and Y which are not included in the table, but can be received in the given projection, it is necessary to measure them manually. For this purpose on the top and left part of the image the rulers are placed. If not it is possible to receive values of the large accuracy, increase the image with tool №25 «Magnifying glass».

The visual analysis:

1. Measure the outstanding of the root of the nose CN radix projection.
2. Measure NT dorsal bridge length of the nose.
3. Measure AcT tip projection of the nose.
4. Define the divided curve of the nose partition. Ac-Sn- C^y-T.

Then work on the algorithm of the modelling process that is similar to the algorithm of work with the free tracker. In the beginning you have set the initial tracker (shown by bright green colour) on the border of the zone of changes (nose).

The modelling of the result can be carried out in different projections. For the greater reliability it is necessary to observe proportions and distances between points for the connected parameters. Such connected parameter, for example, is the projection of the segment N-T on axis Y for the Anterior projection and projection of the same segment to axis Y for the Lateral projection. The value of this parameter should coincide for both projections.

After the initial tracker is constructed press button №20 for transition to the next step.

The resulting tracker (shown with bright red colour) is constructed by transfer of points of the initial tracker to a new place. Function of the resulting tracker is to specify the zones of changes of the nose.

As a result of construction of the resulting tracker there will be a recalculation of values in the information table.

The following step is the selection of boundary areas participating in modelling. For transition press button №20. By the cursor set the points for selection of the area adjacent to the nose that participates in the operation. In the table on the right there are data on deviation of points of the initial tracker from the resulting. In the first column - the names of parameters, in the second - actual values of deviation, in the third - values of deviation on axis O and in the fourth - values of deviation on axis O.

Press button №20 for recalculation and construction of the result of modelling. The further work with the received image is described in paragraph 8.5

12.1.3 Work with the tracker in the Basilar projection (fig. 12).

Key points:

- G** glabella
- C^** columella breakpoint
- T** tip
- Al** alar flare
- Ac** alar crease
- Sn** subnasale
- D** lateral point of the nostril wall

Basic lines:

Vertical line through points **Al**.

Vertical line through points **An**.

Vertical median line through the point **Sn**.

Vertical line through points **D**.

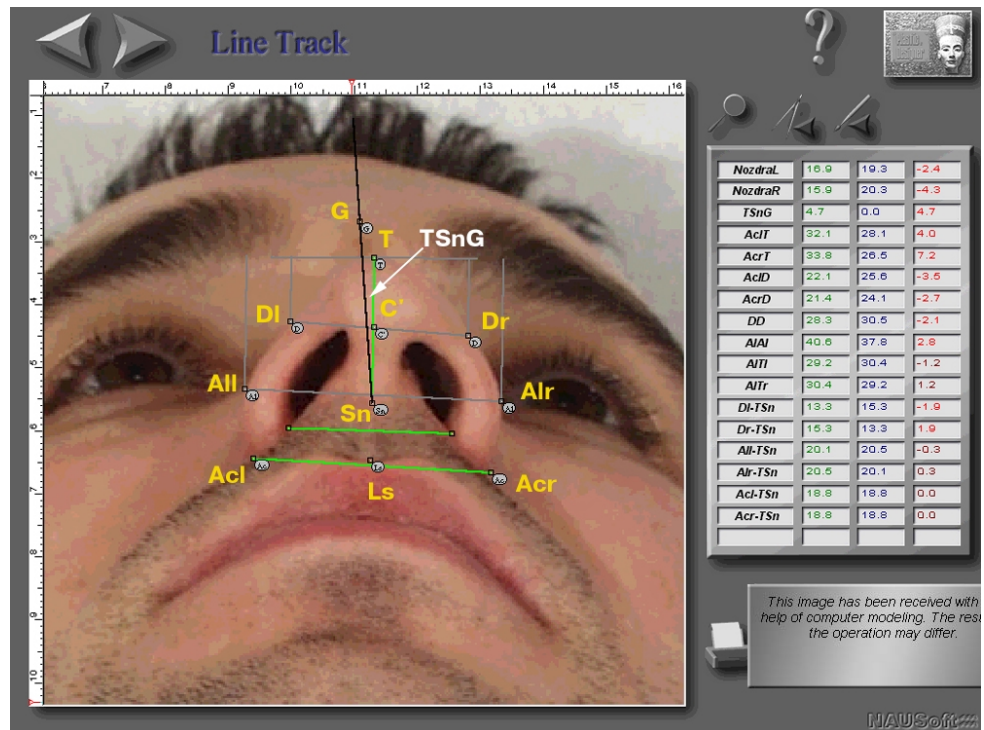
Horizontal line through the point **O**.

Horizontal line through points **Ac-An**.

Horizontal line through points **Al-Al**.

Horizontal line through the point With ^.

Horizontal line through the bottom points of the nostrils.



Using a standard track set the points on the image of the patient. You receive the location of the basic lines that allow to perform the visual analysis.

Information table contains the following data:

- NarisL** perpendicular from the left bottom point of the nostril to the straight line D-D.
- NarisR** perpendicular from the right bottom point of the nostril to the straight line D-D.
- TSnG** angle of deviation of the nose tip O from of the median line.
- AcIT** length of projection of the segment from the left point An to the point O on the straight line O-Sn.
- AcrT** length of projection of the segment from the right point An to the point O on the straight line O-Sn.
- AcID** length of projection of the segment from the left point An up to the point of crossing the straight line D-D from the straight line O-Sn on the straight line O-Sn.

AcrD	length of projection of the segment from the right point An to the point of crossing the straight line D-D from the straight line O-Sn on the straight line O-Sn.
DD	actual distance between points.
AIAI	actual distance between points.
AITI	length of projection of the segment from the left point AI up to the point T on the straight line O-Sn.
AITr	length of projection of the segment from the right point AI up to the point T on the straight line O-Sn.
DI-TSn	distance from the point D left to the straight line O-Sn.
Dr-TSn	distance from the point D right to the straight line O-Sn.
All-TSn	distance from the point AI left to the straight line O-Sn.
Alr-TSn	distance from the point AI right to the straight line O-Sn.
AcI-TSn	distance from the point An left to the straight line O-Sn.
Acr-TSn	distance from the point An right to the straight line O-Sn.

The first column - name of parameter, the second column - real value of parameter, the third column - ideal value of parameter, the fourth column - deviation of the real value from the ideal value. And, if the deviation is more than 5-10 %, it is shown with bright red colour. The visual analysis:

1. Symmetry and deviations from the vertical axis.
2. Distance from O to An-An and distance from A to C ^ correspond as 1 to 2.
3. Distance from O to AI-AI and distance from O to C ^ correspond as 2 to 3.
4. Width of the «over narial» part constitutes 3/4 of the width An-An.
5. The nose should form a right triangle with the top O.

Further work on the algorithm of modelling process described for other projections.

12.1.4 Construction of an «ideal» nose.



In rhinoplasty there is a concept of the «ideal» nose. The certain points are established unequivocally for each patient, but the changes of some distances and angles are possible and if their ratio corresponds to some «ideal» values we receive the most correct nose. The functions of calculation of an «ideal nose» by Bird, Daniel and others are known. The received «ideal» noses not always are the best from the aesthetic point of view for the particular patient.

Evidently these theories were checked up by us with the help of the program. But still we offer an automatic calculation of an «ideal» nose. Probably, it will help someone.

The calculation of an «ideal» nose is stipulated for the side-view. The recalculation of «ideal» parameters occurs by pressing the button:

At the stage of reception of the resulting tracker. The following order of actions is similar to the general algorithm of modelling.

Since we are trying to describe the medical laws mathematically, from the point of view of mathematics there are some contradictions when the performance of some «ideal» parameters leads to displacement of other «ideal» parameters. Therefore we have entered the term «theoretically ideal» nose and «practically allowable ideal» nose.

The values of a «theoretically ideal» nose are given in the information table in the third column at the stage of installation of the initial and resulting trackers. The values of the

practically allowable ideal» nose can be received in the mode of construction of an «ideal» nose, also in the information table, third column.

Thus, the information table of the construction mode of an «ideal» nose contains:

In the first column - names of parameters,

In the second column – values of the practically allowable ideal» nose, in the third column - «theoretically ideal nose», in the fourth - difference of values.

Probably you will observe difference of values of a «theoretically ideal nose» in the mode «Construction of the resulting tracker» and in the mode «Construction of an ideal nose». The reason for these differences can be an incorrectly made photo (for example, not an exact side-view), incorrect calibration of the image in the beginning of work, as well as not exact installation of the initial tracker. Some experience of work with the program is sufficient to learn not to make considerable mistakes. The small divergence of values is not important and does not influence the result of modelling.

12.2 Other types of operations.

The step-by-step creation of the final result of operation on the computer is not the exact imitation of actions that are carried out by the surgeon during the real operation. You do not need to cut and to sew up. The main task is to establish precisely the initial borders of the area of changes and then to select the points of desirable moving of this area. The surgeon knows theoretically the result of the operation, on the basis of his personal experience can imagine what deviations can be from the theory depending on various conditions. Having initial variant, it is required to create the final result applying tools and functions of the program.

The good knowledge of opportunities of the program allows to achieve the final result by different ways. For example, lift of the skin of the forehead and eyebrows on the computer is not attached to the lines of a seam within the hairy part of the head, it is performed by moving of the area of eyebrows and top eyelid with the help of tool №38 «Scalpel» or through the free tracker.

It is very easy to receive the results of dermoimage, correction skin scars, hair transplantation with the help of the editing tools (see 7.6).. The operations including any kinds of skin lifts are carried out through free trackers or the tool for working with an area “Scalpel” and can be slightly adjusted to the final result with the editing tools. For example, blepharoplasty, facelift and lifts of other parts of the body, as well as correction of body contours, liposuction and other.

13. Modelling result of the post-operative period

The plastic operation, no matter how magnificent its final result is, has the post-operative period of restoration to which not each patient is ready. During the restoration period the woman observes an awful picture in a mirror. It seems to her that now she will look this way, she begins to regret that she has decided to make an operation. Not only does it spoils the mood, but also frightens and causes stress. The stress in turn leads to slow recuperation of the body.

Our program allows to simulate the images of results of operation during post-operative period in different terms, for example, in one week, in one month. Some experts say that it is not necessary to do that, that the patient can be frightened and reject the operation in general. Others consider that very important.

In any case the program allows to do that, and you should decide for yourself whether to use it or not.

There is no universal algorithm of restoration. It's hard to predict with accuracy how the tissues and the organism of each patient will act and how the external conditions will influence them. Therefore, not to make a mistake and not to deceive your patients we have decided not to introduce into the program the processes of restoration step by step.

But you can make photos of the patients who have already undergone the surgery and keep them in the card file (see 6.1.1), having specified in the comments to the photo the necessary information on terms and status of recovery. Then these photos can be shown to a new patient. Thus, he will see an unpleasant show of the post-operative period not on himself, but on another person. The example of another person is not so frightening, and the purpose will be achieved - patient will be ready to the post-operative period. Besides the patient will also see final variant after the recovery of another patient, which will create a psychologically positive mood.

Another approach is to make photos of the patient and to simulate with the help of the tools an approximate image basing on your experience (unfortunately, it cannot be incorporated into a computer program). It would be better, if having shown the images you would not keep them in the Card File for the patient. The purpose will be achieved - patient is ready for the operation. Most likely that his recovery will be faster than that predicted by the computer and there will be no necessity to compare the reality with the forecasts.

14. Application of experience of a surgeon in work with the program

The experience of each surgeon is unique, it cannot be described, it is impossible to enter it into a computer program as an algorithm. Besides that the rules used by one surgeon can be absolutely inappropriate for another expert. Our purpose was to make this computer program universal, convenient for everyone who uses it and allowing to apply your own experience and knowledge during work.

We do not exclude the opportunity that in case of a creative approach to work with the program someone will manage to discover its additional opportunities that are not described in this manual.

Conclusion

The program Nautilus Plastic is written in a modern programming language by remarkable programmers, who have previewed an invaluable opportunity for it to develop and to be further improved.

If you have any remarks and offers in the process of the program use please contact us. We plan to collect this information and use it for creation of the following versions of Nautilus Plastic.

All software that we offer on the market is regularly updated. Therefore you can be sure that you are getting a developing product. You have an opportunity to update it regularly and to be always ahead.